

TELEVISION TERMINAL DATA STORAGE

RELATED APPLICATIONS

This application is a Divisional of Application Serial No. 07/991,074, filed December 9, 1992, entitled TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM WITH MENU DRIVEN SUBSCRIBER ACCESS and Application Serial No. 08/160,194, filed December 2, 1993, entitled ADVANCED SET TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS, which is a continuation-in-part of the above-mentioned Application Serial No. 07/991,074.

The following other related applications are continuation-in-part applications, also based on the above-referenced 07/991,074 patent application and filed on December 2, 1993: Serial No. 08/160,281, entitled REPROGRAMMABLE TERMINAL FOR SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM, now U.S. Patent No. 5,798,785; Serial No. 08/160,280, entitled NETWORK CONTROLLER FOR CABLE TELEVISION DELIVERY SYSTEMS, now U.S. Patent No. 5,600,364; Serial No. 08/160,282, entitled AN OPERATIONS CENTER FOR A TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM, now U.S. Patent No. 5,659,350; Serial No. 08/160,193, entitled SET TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS, now U.S. Patent No. 5,734,853; Serial No. 08/160,283, entitled DIGITAL CABLE HEADEND FOR CABLE TELEVISION DELIVERY SYSTEM, now U.S. Patent No. 5,682,195; and Serial No. 08/160,191, entitled TELEVISION PROGRAM DELIVERY SYSTEM, now U.S. Patent No. 5,559,549.

All of the above listed patent applications and patents are hereby incorporated by reference.

TECHNICAL FIELD

The invention relates to television entertainment systems for providing television programming to consumer homes. More particularly, the invention relates to a terminal for use

1 with a program delivery system. Even more particularly, the invention relates to providing data
2 storage and retrieval on such a terminal.

3 4 BACKGROUND OF THE INVENTION

5 Advances in television entertainment have been primarily driven by breakthroughs in
6 technology. In 1939, advances on Vladmir Zworykin's picture tube provided the stimulus for
7 NBC to begin its first regular broadcasts. In 1975, advances in satellite technology provided
8 consumers with increased programming to homes.

9 Many of these technology breakthroughs have produced inconvenient systems for
10 consumers. One example is the ubiquitous three remote control home, having a separate and
11 unique remote control for the TV, cable box and VCR. More recently, technology has provided
12 cable users in certain parts of the country with 100 channels of programming. This increased
13 program capacity is beyond the ability of many consumers to use effectively. No method of
14 managing the program choices has been provided to consumers.

15 Consumers are demanding that future advances in television entertainment, particularly
16 programs and program choices, be presented to the consumer in a user friendly manner.
17 Consumer preferences, instead of technological breakthroughs, will drive the television
18 entertainment market for at least the next twenty years. As computer vendors have experienced
19 a switch from marketing new technology in computer hardware to marketing better useability,
20 interfaces and service, the television entertainment industry will also experience a switch from
21 new technology driving the market to consumer useability driving the market.

22 Consumers want products incorporating new technology that are useful, and will no
23 longer purchase new technology for the sake of novelty or status. Technological advances in
24 sophisticated hardware are beginning to surpass the capability of the average consumer to use the
25 new technology. Careful engineering must be done to make entertainment products incorporating
26 new technology useful and desired by consumers.

27 In order for new television entertainment products to be successful, the products must
28 satisfy consumer demands. TV consumers wish to go from limited viewing choices to a variety
29 of choices, from no control of programming to complete control. Consumers wish to advance

1 from cumbersome and inconvenient television to easy and convenient television and keep costs
2 down. Consumers do not wish to pay for one hundred channels when due to lack of
3 programming information, they seldom, if ever, watch programming on many of these channels.

4 The concepts of interactive television, high definition television and 300 channel cable
5 systems in consumer homes will not sell if they are not packaged, delivered and presented in a
6 useable fashion to consumers. The problem is that TV programming is not being delivered and
7 presented to consumers in a user friendly manner.

8 Consumers are already being bombarded with programming options, numerous "free"
9 cable channels, subscription cable channels and pay-per-view choices. Any further increase in
10 TV entertainment choices, without a user friendly presentation and approach, will likely bewilder
11 viewers with a mind-numbing array of choices.

12 The TV industry has traditionally marketed and sold its programs to consumers in bulk,
13 such as continuous feed broadcast and long-term subscriptions to movie channels. The TV
14 industry is unable to sell its programming in large quantities on a unit per unit basis, such as the
15 ordering of one program. Consumers prefer a unit sales approach because it keeps costs down
16 and allows the consumer to be more selective in their viewing.

17 In addition, viewership fragmentation, which has already begun, will increase.
18 Programming not presented in a user friendly manner will suffer with a decrease in viewership
19 and revenue. As programming presentation becomes more user friendly, users seek additional
20 features and functional capabilities.

21 What is needed is a set top converter with enhanced functionality.

22 What is needed is a set top converter that provides users with advanced features and
23 capabilities.

24 What is needed is technology that upgrades the functionality of existing set top
25 converters.

26 What is needed is hardware that provides an upgrade capability allowing the use of
27 existing set top converter technology in advanced program delivery systems.

28 What is needed is a set top converter that provides an upstream communications
29 capability between the set top converter and cable headend.

1 What is needed is a set top converter that provides a capability of generating menus for
2 display.

3 What is needed is a set top converter that provides a simple way to select a program from
4 a menu.

5 Certain embodiments of the present invention are capable of fulfilling these needs.

6 7 SUMMARY OF INVENTION

8 In one respect, the present invention is a hardware upgrade for a terminal for use with a
9 television program delivery system. The hardware upgrade comprises an interface to the terminal
10 and a disc storage device, such as a CD-ROM, for example, connected to the interface. The disc
11 storage device may contain data concerning games, education, encyclopedias, reference
12 information, economics, and the like. Optionally, the terminal may receive programming
13 instructions to retrieve the data stored on the disc.

14 In another aspect, the present invention is a terminal for use with a television program
15 delivery system. The terminal comprises a receiver adapted to receive programs and a first
16 hardware upgrade, which comprises an interface to the terminal and a disc storage device
17 connected to the interface. One or more additional hardware upgrades may be connected to the
18 terminal, preferably in a daisy-chain arrangement, such as a SCSI daisy-chain.

19 In another aspect, the present invention is a system comprising a terminal and a television
20 program delivery system adapted to deliver television program signals. The terminal comprises
21 a receiver adapted to receive at least some of the television program signals and a hardware
22 upgrade, which comprises an interface to the terminal and a disc storage device connected to the
23 interface. The system is preferably a cable television program delivery system.

24 In another aspect, the present invention is a television terminal comprising a television
25 program receiver, a disc storage device; and an output connected to the receiver and the disc
26 storage device, wherein the output accepts television program signals from the receiver and data
27 signals from the disc storage device. The output may be, for example, a video display.

28 In yet another aspect, the present invention is a method comprising the steps of receiving
29 a television program, accessing data on a disc storage device, and displaying the television

1 program and/or information based on the accessed data. The data may concern games, education,
2 encyclopedias, reference information, economics, and the like. Optionally, the terminal may
3 receive programming instructions, in a vertical blanking interval or a program control
4 information signal, to retrieve the data stored on the disc.

5 Advantages of the invention will become obvious to those skilled in the art upon review
6 of the following description, the attached drawings and appended claims.

7 8 DESCRIPTION OF THE DRAWINGS

9 Figure 1 is a diagram of the primary components of the television delivery system.

10 Figure 2 is a schematic of the operation of the primary components of the system.

11 Figure 3 is a block diagram of the hardware components of the set top terminal.

12 Figure 4 is a perspective front view of a set top terminal.

13 Figure 5 is a perspective rear view of a set top terminal.

14 Figure 6 is a block diagram of a Turbo card upgrade for a set top terminal.

15 Figure 7a is a drawing of a frame format for program control information signal.

16 Figure 7b is a drawing of a frame format for a polling response from the set top terminal.

17 Figure 8 is a drawing of the basic menus used in the present invention, including the ten
18 major menus represented by icons.

19 Figure 9a is a schematic of a basic decompression box with upgrade module and
20 associated connections.

21 Figure 9b is a schematic of an alternative embodiment of a simple decompression box
22 with upgrade module and associated connections.

23 Figure 10 is a more detailed block diagram of the components of a simple decompression
24 box with upgrade module.

25 Figure 11 is a schematic of the set top terminal's upstream data transmission hardware.

26 Figure 12a is a schematic showing the components of the Level A, B, and C hardware
27 upgrades.

28 Figure 12b is a schematic showing the components of the Level D hardware upgrade.

1 Figure 13 is a drawing of an interactive television promotional menu for a set top terminal
2 hardware upgrade.

3 Figures 14a and 14b are drawings of submenus for interactive television services using
4 hardware upgrade Level A.

5 Figures 15a through 15d are drawings of interactive services using hardware upgrade
6 Level B, which are related to on-screen airline reservations.

7
8 **DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT**

9
10 **A. Television Program Delivery System Description**

11 **1. Introduction**

12 Figure 1 shows the present invention as part of an expanded cable television program
13 delivery system 200 that dramatically increases programming capacity using compressed
14 transmission of television program signals. Developments in digital bandwidth compression
15 technology now allow much greater throughput of television program signals over existing or
16 slightly modified transmission media. The program delivery system 200 shown provides
17 subscribers with a user friendly interface to operate and exploit a six-fold or more increase in
18 current program delivery capability.

19 Subscribers are able to access an expanded television program package and view selected
20 programs through a menu-driven access scheme that allows each subscriber to select individual
21 programs by sequencing a series of menus. The menus are sequenced by the subscriber using
22 simple alpha-numeric and iconic character access or moving a cursor or highlight bar on the TV
23 screen to access desired programs by simply pressing a single button, rather than recalling from
24 memory and pressing the actual two or more digit numeric number assigned to a selection. Thus,
25 with the press of a single button, the subscriber can advance from one menu to the next. In this
26 fashion, the subscriber can sequence the menus and select a program from any given menu. The
27 programs are grouped by category so that similar program offerings are found on the same menu.

2. Major System Components

In its most basic form, the system uses a program delivery system 200 in conjunction with a conventional concatenated cable television system 210. The program delivery system 200 generally includes (i) at least one operations center 202, where program packaging and control information are created and then assembled in the form of digital data, (ii) a digital compression system, where the digital data is compressed, combined/multiplexed, encoded, and mapped into digital signals for satellite transmission to the cable headend 208, and (iii) a set of in-home decompressors. The program delivery system 200 transports the digital signals to the cable headend 208 where the signals are transmitted through a concatenated cable television system 210. Within the cable headend 208, the received signals may be decoded, demultiplexed, managed by a local central distribution and switching mechanism, combined and then transmitted to the set top terminal 220 located in each subscriber's home over the cable system 210. Although concatenated cable systems 210 are the most prevalent transmission media to the home, telephone lines, cellular networks, fiber optics, Personal Communication Networks and similar technology for transmitting to the home can be used interchangeably with this program delivery system 200.

The delivery system 200 has a reception region 207 with an in-home decompression capability. This capability is performed by a decompressor housed within a set top terminal 220 in each subscriber's home. The decompressor remains transparent from the subscriber's point of view and allows any of the compressed signals to be demultiplexed and individually extracted from the composite data stream and then individually decompressed upon selection by the subscriber. The decompressed video signals are converted into analog signals for television display. Such analog signals include NTSC formatted signals for use by a standard television. Control signals are likewise extracted and decompressed and then either executed immediately or placed in local storage such as a RAM. Multiple sets of decompression hardware may be used to decompress video and control signals. The set top terminal 220 may then overlay or combine different signals to form the desired display on the subscriber's television. Graphics on video or picture-on-picture are examples of such a display.

1 Although a single digital compression standard (e.g., MPEG) may be used for both the
2 program delivery system 200 and the concatenated cable system 210, the compression technique
3 used may differ between the two systems. When the compression standards differ between the
4 two media, the signals received by the cable headend 208 must be decompressed before
5 transmission from the headend 208 to the set top terminals 220. Subsequently, the cable headend
6 208 must recompress and transmit the signals to the set top terminal 220, which would then
7 decompress the signals using a specific decompression algorithm.

8 The video signals and program control signals received by the set top terminal 220
9 correspond to specific television programs and menu selections that each subscriber may access
10 through a subscriber interface. The subscriber interface is a device with buttons located on the
11 set top terminal 220 or on a portable remote control 900. In the preferred system embodiment,
12 the subscriber interface is a combined alpha-character, numeric and iconic remote control device
13 900, which provides direct or menu-driven program access. The preferred subscriber interface
14 also contains cursor movement and go buttons as well as alpha, numeric and iconic buttons. This
15 subscriber interface and menu arrangement enables the subscriber to sequence through menus
16 by choosing from among several menu options that are displayed on the television screen. In
17 addition, a user may bypass several menu screens and immediately choose a program by selecting
18 the appropriate alpha-character, numeric or iconic combinations on the subscriber interface. In
19 the preferred embodiment, the set top terminal 220 generates the menus that are displayed on the
20 television by creating arrays of particular menu templates, and the set top terminal 220 displays
21 a specific menu or submenu option for each available video signal.

22 Figure 2 shows an embodiment where the cable headend 208 and the subscriber's home
23 are linked by certain communications media 216. In this particular embodiment, analog signals,
24 digitally compressed signals, other digital signals and up-stream/interactivity signals are sent and
25 received over the media 216. The cable headend 208 provides such signalling capabilities in its
26 dual roles as a signal processor 209 and network controller 214.

1 3. Set Top Terminal

2 The set top terminal 220 is the portion of the delivery system 200 that resides in the home
3 of a subscriber. The set top terminal 220 is usually located above or below the subscriber's
4 television, but it may be placed anywhere in or near the subscriber's home as long as it is within
5 the range of the subscriber's remote control device 900. In some aspects, the set top terminal 220
6 may resemble converter boxes already used by many cable systems. For instance, each set top
7 terminal 220 may include a variety of error detection, decryption, and coding techniques such as
8 anti-taping encoding. However, it will become apparent from the discussion below that the set
9 top terminal 220 is able to perform many functions that an ordinary converter box cannot
10 perform.

11 The set top terminal 220 has a plurality of input and output ports to enable it to
12 communicate with other local and remote devices. The set top terminal 220 has an input port that
13 receives information from the cable headend 208. In addition, the unit has at least two output
14 ports which provide communications from the set top terminal 220 to a television and a VCR.
15 Certain menu selections may cause the set top terminal 220 to send control signals directly to the
16 VCR to automatically program or operate the VCR. Also, the set top terminal 220 contains a
17 phone jack which can be used for maintenance, trouble shooting, reprogramming and additional
18 customer features. The set top terminal 220 may also contain stereo/audio output terminals and
19 a satellite dish input port.

20 Functionally, the set top terminal 220 is the last component in the delivery system chain.
21 The set top terminal 220 receives compressed program and control signals from the cable
22 headend 208 (or, in some cases, directly from the operations center 202). After the set top
23 terminal 220 receives the individually compressed program and control signals, the signals are
24 demultiplexed, decompressed, converted to analog signals (if necessary) and either placed in
25 local storage (from which the menu template may be created), executed immediately, or sent
26 directly to the television screen.

27 After processing certain signals received from the cable headend 208, the set top terminal
28 220 is able to store menu templates for creating menus that are displayed on a subscriber's
29 television by using an array of menu templates. Before a menu can be constructed, menu

1 templates must be created and sent to the set top terminal 220 for storage. A microprocessor uses
2 the control signals received from the operations center 202 or cable headend 208 to generate the
3 menu templates for storage. Each menu template may be stored in volatile memory in the set top
4 terminal 220. When the set top terminal receives template information it demultiplexes the
5 program control signals received from the cable headend 208 into four primary parts: video,
6 graphics, program logic and text. Each menu template represents a different portion of a whole
7 menu, such as a menu background, television logo, cursor highlight overlay, or other
8 miscellaneous components needed to build a menu. The menu templates may be deleted or
9 altered using control signals received from the operations center 202 or cable headend 208.

10 Once the menu templates have been stored in memory, the set top terminal 220 can
11 generate the appropriate menus. In the preferred embodiment, the basic menu format information
12 is stored in memory located within the set top terminal 220 so that the microprocessor may
13 locally access the information from the set top terminal instead of from an incoming signal. The
14 microprocessor next generates the appropriate menus from the menu templates and the other
15 menu information stored in memory. The set top terminal 220 then displays specific menus on
16 the subscriber's television screen that correspond to the inputs the subscriber selects.

17 If the subscriber selects a specific program from a menu, the set top terminal 220
18 determines on which channel the program is being shown, demultiplexes and extracts the single
19 channel transmitted from the cable headend 208. The set top terminal 220 then decompresses
20 the channel and, if necessary, converts the program signal to an analog NTSC signal to enable
21 the subscriber to view the selected program. The set top terminal 220 can be equipped to
22 decompress more than one program signal, but this would unnecessarily add to the cost of the
23 unit since a subscriber will generally only view one program at a time. However, two or three
24 decompressors may be desirable to provide picture-on-picture capability, control signal
25 decompression, enhanced channel switching or like features.

26 In addition to menu information, the set top terminal 220 may also store text transmitted
27 from the cable headend 208 or the operations center 202. The text may inform the subscriber
28 about upcoming events, billing and account status, new subscriptions, or other relevant

1 information. The text will be stored in an appropriate memory location depending on the
2 frequency and the duration of the use of the textual message.

3 Also, optional upgrades are available to enhance the performance of a subscriber's set top
4 terminal 220. These upgrades may consist of a cartridge or computer card (not shown) that is
5 inserted into an expansion slot in the set top terminal 220 or may consist of a feature offered by
6 the cable headend 208 or operations center 202 to which the user may subscribe. Available
7 upgrades may include on line data base services, interactive multi-media services, access to
8 digital radio channels, and other services.

9 In the simplest embodiment, available converter boxes such as those manufactured by
10 General Instruments or Scientific Atlanta, may be modified and upgraded to perform the
11 functions of a set top terminal 220. The preferred upgrade is a circuit card with a microprocessor
12 which is electronically connected to or inserted into the converter box.

13 14 4. Remote Control Device

15 The primary conduit for communication between the subscriber and the set top terminal
16 220 is through the subscriber interface, preferably a remote control device 900. Through this
17 interface, the subscriber may select desired programming through the system's menu-driven
18 scheme or by directly accessing a specific channel by entering the actual channel number. Using
19 the interface, the subscriber can navigate through a series of informative program selection
20 menus. By using menu-driven, iconic or alpha-character access, the subscriber can access desired
21 programs by simply pressing a single button rather than recalling from memory and pressing the
22 actual channel number to make a selection. The subscriber can access regular broadcast and basic
23 cable television stations by using either the numeric keys on the remote control 900 (pressing the
24 corresponding channel number), or one of the menu icon selection options.

25 In addition to enabling the subscriber to easily interact with the cable system 200, the
26 physical characteristics of the subscriber interface 900 should also add to the user friendliness
27 of the system. The remote control 900 should easily fit in the palm of the user's hand. The
28 buttons of the preferred remote control 900 contain pictorial symbols that are easily identifiable

by the subscriber. Also, buttons that perform similar functions may be color coordinated and consist of distinguishing textures to increase the user friendliness of the system.

5. Menu-Driven Program Selection

The menu-driven scheme provides the subscriber with one-step access to all major menus, ranging from hit movies to sport specials to specialty programs. From any of the major menus, the subscriber can in turn access submenus and minor menus by cursor or alpha-character access.

There are two different types of menus utilized by the preferred embodiment, the Program Selection menus and the During Program menus. The first series of menus, Program Selection menus, consists of an Introductory, a Home, Major menus, and Submenus. The second series of menus, During Program menus, consists of two primary types, Hidden menus and the Program Overlay menus.

Immediately after the subscriber turns on the set top terminal 220, the Introductory menu welcomes the subscriber to the system. The Introductory menu may display important announcements from the local cable franchise, advertisements from the cable provider, or other types of messages. In addition, the Introductory menu can inform the subscriber if the cable headend 208 has sent a personal message to the subscriber's particular set top terminal 220.

After the Introductory menu has been displayed the subscriber may advance to the next level of menus, namely the Home menu. In the preferred embodiment, after a certain period of time, the cable system will advance the subscriber by default to the Home menu. From the Home menu, the subscriber is able to access all of the programming options. The subscriber may either select a program directly by entering the appropriate channel number from the remote control 900, or the subscriber may sequence through incremental levels of menu options starting from the Home menu. The Home menu lists categories that correspond to the first level of menus called Major menus.

If the subscriber chooses to sequence through subsequent menus, the subscriber will be forwarded to the Major menu that corresponds to the chosen category from the Home menu. The Major menus further refine a subscriber's search and help guide the subscriber to the selection of his choice.

1 From the Major menus, the subscriber may access several submenus. From each
2 submenu, the subscriber may access other submenus until the subscriber finds a desired television
3 program. Similar to the Major menu, each successive level of Submenus further refines the
4 subscriber's search. The system also enables the subscriber to skip certain menus or submenus
5 and directly access a specific menu or television program by entering the appropriate commands
6 on the remote control 900.

7 The During program menus (including Hidden Menus and Program Overlay Menus) are
8 displayed by the set top terminal 220 only after the subscriber has selected a television program.
9 In order to avoid disturbing the subscriber, the set top terminal 220 does not display the Hidden
10 Menus until the subscriber selects the appropriate option to display a Hidden Menu. The Hidden
11 Menus contain options that are relevant to the program selected by the viewer. For example, a
12 Hidden Menu may contain options that enable a subscriber to enter an interactive mode or escape
13 from the selected program.

14 Program Overlay Menus are similar to Hidden Menus because they occur during a
15 program and are related to the program being viewed. However, the Program Overlay Menus
16 are displayed concurrently with the program selected by the subscriber. Most Program Overlay
17 Menus are small enough on the screen to allow the subscriber to continue viewing the selected
18 program comfortably.

19
20 **B. Detailed Set Top Terminal Description**

21 The set top terminal 220 receives and manipulates signals from the cable headend 208.
22 The set top terminal 220 is equipped with local computer memory and the capability of
23 interpreting the digitally compressed signal to produce menus for the subscriber. The remote
24 control 900 communicates the subscriber's selections to the set top terminal 220. The
25 subscriber's selections are generally based upon menus or other prompts displayed on the
26 television screen.

27 It is preferred that the signal reaches the subscriber's home in a compressed format and
28 is decompressed prior to viewing. Included in the delivered program signal is information that
29 enables equipment at the subscriber's home to display menus for choosing particular programs.

1 Depending on the particular embodiment, the television program signal may arrive at the
2 subscriber's home through one or more connections such as coaxial cables, fiber cables, twisted
3 pairs, cellular telephone connections, or personal communications network (PCN) hookups.

4 The program control information signal is generated by the operations center 202 and
5 provides the network controller 214 with data on the scheduling and description of programs.
6 In an alternate configuration, this data is sent directly to the set top terminal 220 for display to
7 the subscriber. In the preferred embodiment, the program control information signal is stored and
8 modified by the network controller 214 and sent to the set top terminal 220 in the form of a set
9 top terminal control information stream (STTCIS). The set top terminal 220 integrates either the
10 program control information signal or the STTCIS with data stored in the memory of the set top
11 terminal 220 to generate on-screen menus that assist the subscriber in choosing programs for
12 display.

13 The types of information that can be sent using the program control signal include:
14 number of program categories, names of program categories, what channels are assigned to a
15 specific category (such as specialty channels), names of channels, names of programs on each
16 channel, program start times, length of programs, description of programs, menu assignment for
17 each program, pricing, whether there is a sample video clip for advertisement for the program,
18 and any other program, menu or product information.

19 With a minimal amount of information being communicated to the set top terminal 220
20 on a regular basis, the set top terminal 220 is able to determine the proper menu location for each
21 program and the proper time and channel to activate for the subscriber after a menu selection.
22 The program control information signal and STTCIS can be formatted in a variety of ways and
23 the on-screen menus can be produced using many different methods. For instance, if the program
24 control information signal carries no menu format information, the menu format for creating the
25 menus can be fixed in ROM at the set top terminal 220. In the preferred embodiment, the menu
26 format information is stored at the set top terminal 220 in a temporary memory device such as
27 a RAM or EPROM. New menu format information is sent via the program control information
28 signal or the STTCIS to the set top terminals 200 whenever a change to a menu format is desired.

1 In the simplest embodiment, the menu formats remain fixed and only the text changes.
 2 In this way the program control information signal can be limited to primarily text and a text
 3 generator can be employed in the set top terminal 220. Another simple embodiment uses a
 4 separate channel full-time (large bandwidth) just for the menu information.

5 Live video signals may be used in windows of certain menus. These video signals can
 6 be transmitted using the program control information signal or STTCIS, or can be taken off
 7 channels being transmitted simultaneously with the menu display. Video for menus, promos or
 8 demos may be sent to the set top terminal 220 in several formats, including (1) on a dedicated
 9 channel, (2) on a regular program channel and scaled to size, or (3) along with the program
 10 control information signal. However, in the preferred embodiment, a large number of short
 11 promos or demo video is sent using a split screen technique on a dedicated channel. A multiple
 12 window technique may be used with the menus to display a description of a program and one or
 13 more video frames that assist the subscriber in selecting the program.

14 Figure 3 shows the basic hardware components of the set top terminal 220. The set top
 15 terminal 220 has a tuner 603, digital demodulator 606, decryptor 600, and demultiplexers 609,
 16 616 as well as audio equipment 612 and a remote control interface 626 for receiving and
 17 processing signals from the remote control unit 900. An optional modem 627 allows
 18 communication between a microprocessor 602 and the cable headend 208. An NTSC encoder
 19 625 provides a standard NTSC video output.

20 The microprocessor 602 is capable of executing program instructions stored in memory.
 21 These instructions allow a user to access various menus by making selections on the remote
 22 control 900.

23 The manner in which the video is decompressed and the menus are generated from the
 24 program control information signal or STTCIS varies depending on the specific embodiment of
 25 the invention. Video decompressors 618 and 622 may be used if the video is compressed. The
 26 program control information signal may be demultiplexed into its component parts, and a video
 27 decompressor 618, graphic decompressor, text generator and video combiner 624 may be used
 28 to assist in creating the menus.

1 In addition to the menu format information that is stored in graphics memory, the set top
2 terminal 220 also stores data, tracking those programs that have been selected for viewing. By
3 gathering this data, the set top terminal 220 can maintain an accurate record of all programs
4 accessed/watched by storing the data in EEPROM or RAM. Subsequently, this data can be
5 transmitted to the cable headend 208, where it can be used in carrying out network control and
6 monitoring functions. Such data transmissions between the set top terminal 220 and cable
7 headend 208 can be accomplished, for example, through upstream transmission over the cable
8 network or over telephone lines through the use of telephone modems. Where upstream
9 transmission over the cable network is used, the set top terminals 220 can complete data
10 transmissions on a scheduled (e.g., using a polling response or status report to respond to polling
11 requests sent from the cable headend 208) or as-needed (e.g., using a random access technique)
12 basis.

13 Figure 4 shows the front panel of the set top terminal 220, which includes an infrared
14 sensor 630 and a series of LED displays 640. The LED displays 640 may indicate with an icon
15 or a letter (e.g. A-K) the major menu currently selected by the set top terminal 220 or the
16 channels selected directly by a user, or menu channel selections (e.g., from 1 to 50). Further
17 displays may include current channel, time, volume level, sleep time, parental lock (security),
18 account balance, use of a hardware upgrade, second channel being recorded by VCR, use of the
19 Level D music hardware upgrade in a separate room, and any other displays useful to a subscriber
20 to indicate the current status of the set top terminal 220. The LEDs 640 may also provide an
21 indication of the digital audio channel currently tuned.

22 The set top terminal 220 includes a flapped opening 635 on its front that allows the
23 insertion of a magnetic cartridge (or similar portable storage device, including optical disk, ROM,
24 EPROM, etc. not shown). This cartridge opening 635 allows the set top terminal 220 to be
25 upgraded or reprogrammed locally with the use of a magnetic tape cartridge.

26 On the top or cover of the set top terminal 220 are located pushbutton controls 645. Any
27 function that can be performed on the remote 900 may also be performed at the set top terminal
28 220 using the duplicative pushbutton controls 645.

Figure 5 shows the back of the set top terminal 220, which includes a pair of output terminals 650, pair of input terminals 652, pair of stereo/audio output terminals 654, satellite dish input port 656, telephone jack 658 and an RS-422 port 660. In addition, an upgrade port 662 and a cover plate 664 are held in place by a series of sheet metal screws. One of the output terminals 650 is for a television and the other is for a VCR. The set top terminal 220 is equipped to handle incoming signals on one or two cables using the input terminals 652. The phone jack 658 and an RS-232 or RS-422 port 660 are provided for maintenance, trouble shooting, reprogramming and additional customer features. In alternate embodiments, the telephone jack 658 may be used as the primary mode of communication between the cable headend 208 and the set top terminal 220. This connection is possible through the local telephone, cellular telephone or a personal communications network (PCN).

The basic programming of each set top terminal 220 is located on ROM within the set top terminal 220. Random access memory, the magnetic cartridge capability, and the expansion card slot 635 each allow upgrades and changes to be easily made to the set top terminal 220.

In the preferred embodiment, the set top terminal 220 includes a hardware upgrade port 662, in addition to expansion card slots. The hardware upgrade port 662 accommodates a four-wire (or more) connection for: (1) error corrected, decrypted data output of the set top terminal 220, (2) a control interface, (3) decompressed video output, and (4) a video input port. In the preferred embodiment, multiple wires are used to perform each of the four functions. The four sets of wires are combined in a single cable with a single multipin connector.

In the preferred embodiment, multipin connections may be used for the multiwire cable. The multipin connection 662 may range from DB9 to DB25. A variety of small computer systems interface (SCSI) ports may also be provided. Alternatively, four or more ports may be provided instead of the single port depicted.

Another port 662 is used to attach the various hardware upgrades described below to a set top terminal 220. The preferred embodiment has a number of hardware upgrades available for use with a set top terminal 220, including: (1) a Level A interactive unit, (2) a Level B interactive unit, (3) a Level C interactive unit with compact disc capability, (4) a Level D digital radio tuner for separate room use, and (5) a Level E information download unit. Each of these

1 upgrades may be connected to the set top terminal 220 unit through the upgrade port 662
2 described earlier. The same four wires in a single cable described earlier may be used.

3 Existing set top converter boxes such as those made by Scientific Atlanta or General
4 Instruments are presently unequipped to handle the menu selection system of the present
5 invention. Thus, hardware modifications are necessary in order to use the menu selection system
6 with existing set top converter technology.

7 A Turbo Card addition to a set top converter is depicted in Figure 6. The Turbo Card 700
8 shown provides the additional functionality needed to utilize the menu system with existing set
9 top converter technology. The primary functions the Turbo Card 700 adds to the set top
10 converter are the interpreting of program control information signals, generating of menus,
11 sequencing of menus, and, ultimately, the ability of the viewer to select a channel through the
12 menu system without entering any channel identifying information. The turbo card also provides
13 a method for a remote location, such as the cable headend 208, to receive information on
14 programs watched and control the operation of the set top converter and Turbo Card 700. The
15 programs watched information and control commands may be passed from the cable headend 208
16 to the Turbo Card 700 using telephone lines.

17 The primary components of the Turbo Card 700 are a PC chip CPU 702, a VGA graphic
18 controller 704, a video combiner 706, logic circuitry 708, NTSC encoder 710, a receiver 712,
19 demodulator 714, and a dialer 716. The Turbo Card 700 operates by receiving the program
20 control information signal from the cable headend 208 through the coaxial cable. The logic
21 circuitry 708 of the Turbo Card 700 receives data, infrared commands, and synchronization
22 signals from the set top converter. Menu selections made by the viewer on the remote control
23 900 are received by the set top converter's IR equipment and passed through to the Turbo Card
24 700. The Turbo Card 700 interprets the IR signal and determines the program (or menu) the
25 viewer has selected. The Turbo Card 700 modifies the IR command to send the program
26 selection information to the set top converter 221. The modified IR command contains the
27 channel information needed by the set top converter. Using the phone line and dialer 716, the
28 Turbo Card 700 is able to transmit program access information to the cable headend 208.

1 In the preferred embodiment, program access information, that is what programs the
 2 viewer watched, is stored at each set top terminal 220 until it is polled by the network controller
 3 214 using a polling request message format as shown in Figure 7a. This frame format 920
 4 consists of six fields, namely: (1) a leading flag 922 at the beginning of the message, (2) an
 5 address field 924, (3) a subscriber region designation 926, (4) a set top terminal identifier 928
 6 that includes a polling command/response (or P/F) bit 930, (5) an information field 932, and (6)
 7 a trailing flag 934 at the end of the message. Figure 7b shows a response frame format 920'
 8 (similar to the frame format 920 end, therefore, commonly numbered with the frame depicted in
 9 Figure 7a, but with the prime indicator added for clarity) for information communicated by the
 10 set top terminal 220 to the network controller 214 in response to the polling request of Figure 7a.

11 The eight-bit flag sequence 922 that appears at the beginning and end of a frame is used
 12 to establish and maintain synchronization. Such a sequence typically consists of a "01111110"
 13 bit-stream. The address field 924 designates a 4-bit address for a given set top terminal 220. The
 14 subscriber region designation 926 is a 4-bit field that indicates the geographical region in which
 15 the subscriber's set top terminal 220 is housed. The set top terminal identifier 928 is a 16-bit
 16 field that uniquely identifies each set top terminal 220 with a 15-bit designation followed by an
 17 appended P/F bit 930. Although field size is provided by this example, a variety of sizes can be
 18 used with the present invention.

19 The P/F bit 930 is used to command a polling response from the set top terminal 220
 20 addressed, as described below. The response frame format 920' also provides a variable-length
 21 information field 932' for other data transmissions, such as information on system updates. The
 22 frame format 920' ends with an 8-bit flag (or trailing flag) 934' that is identical in format to the
 23 leading flag 922', as set forth above. Other frame formats (e.g., MPEG) will be apparent to one
 24 skilled in the art and can be easily adapted for use with the system.

25 As summarized above, images or programs may be selected for display by sequencing
 26 through a series of menus. Figure 8 is an example of one possible structure for a series of menus.
 27 Generally, the sequence of menus is structured with an introductory menu, a home menu, various
 28 major menus and a multitude of submenus. The submenus can include promo menus and during
 29 program menus. For example, at the home menu portion of the sequence of menus and

1 corresponding software routines, a subscriber may select one of the major menus and start a
2 sequence of menu displays. Alternatively, a subscriber may go directly to a major menu by
3 depressing a menu select button on remote control 900.

4 At any time during the menu sequence, the subscriber may depress a major menu button
5 to move into another series of menus. In this way, a subscriber may move from major menu to
6 major menu.

7 The various software subroutines executed by the microprocessor 602 allow a subscriber
8 to sequence the menus, navigating through the various menus of the present invention. A
9 subscriber may sequence back through menus or return to the home menu with a single touch of
10 the home menu button on remote 900.

11 An introductory menu screen 1000 automatically appears upon power-up and
12 initialization of the set top terminal 220. From this introductory menu screen 1000, the set top
13 terminal software will normally advance the subscriber to the home menu screen 1010. The
14 home menu 1010 is the basic menu that the subscriber will return to in order to make the first
15 level of viewing decisions. When the set top terminal software is displaying the home menu
16 1010, the subscriber is able to access any television programming option. The software allows
17 programming options to be entered through cursor movement on the screen and directly by button
18 selection on the remote control 900.

19 In the normal progression through the menu screens, the software will forward the
20 subscriber to a major menu screen 1020 in response to the subscriber's remote control 900
21 selection or highlighted cursor selection from the home menu screen 1010. The selections
22 displayed on the home menu 1010 are for large categories of programming options.

23 Following the major menu 1020, the subscriber may navigate through one or more
24 submenu screens 1050 from which the subscriber may choose one particular program for
25 viewing. For most programming selections, the user will proceed from the home menu 1010 to
26 a major menu 1020 and then to one or more submenus 1050. However, for certain programming
27 options or functions of the set top terminal 220, the user may skip one or more menus in the
28 sequence.

1 The During Program Menus 1200 are submenus enabled by the set top terminal software
 2 only after the subscriber has selected a television program. These menus provide the subscriber
 3 with additional functionality and/or additional information while viewing a selected program.
 4 The During Program Menus 1200 sequence can be further subdivided into at least two types of
 5 menus, Hidden Menus 1380 and Program Overlay Menus 1390.

6 To avoid disturbing a subscriber during viewing of a program, the Hidden Menus 1380
 7 are not shown to the subscriber but instead "reside" at the set top terminal 220 microprocessor
 8 602. The microprocessor 602 awaits a button entry either from the remote control 900 or set top
 9 terminal 220 buttons before executing or displaying any Hidden Menu 1380 options. The set top
 10 terminal software provides the subscriber with additional functions such as entering an
 11 interactive mode or escaping from a selected program through use of Hidden Menus 1380.

12 Program Overlay Menus 1390 are similar to Hidden Menus 1380. However, the Program
 13 Overlay Menus 1390 are overlayed onto portions of the displayed video and not hidden. The
 14 software for the Program Overlay Menus 1390 allows the subscriber to continue to watch the
 15 selected television program with audio but places graphical information on a portion of the
 16 television screen. Most Program Overlay Menus 1390 are graphically generated to cover small
 17 portions of video. Some Overlays 1390 which are by their nature more important than the
 18 program being viewed will overlay onto greater portions of the video. Examples of types of
 19 overlay menus 1390 include Notification Menus 1392 and Confirmation Menus 1394. In the
 20 preferred embodiment, the software for the Program Overlay Menus 1390 controls the reduction
 21 or scales down the (entire) programs video and redirects the video to a portion of the screen.

22 Submenus provide the cost of viewing the program and the program's length in hours and
 23 minutes. From the submenus, the subscriber is given at least three options: (1) to purchase a
 24 program, (2) to return to the previous menu, and (3) to press "go" and return to regular TV. The
 25 subscriber may also be given other options such as previewing the program.

26 Using an on-screen menu approach to program selection, there is nearly an unlimited
 27 number of menus that can be shown to the subscriber. The memory capability of the set top
 28 terminal 220 and the quantity of information that is sent using the program control information
 29 signal are the only limits on the number of menus and amount of information that can be

1 displayed to the subscriber. The approach of using a series of menus in a simple tree sequence
2 is both easy for the subscriber to use and simply implemented by the set top terminal 220 and
3 remote control device 900 with cursor movement. A user interface software programmer will
4 find many obvious variations from the preferred embodiment described.

5 The set top terminal 220 generates and creates menus using, in part, information stored
6 in its graphics memory. A background graphics file 800 will store menu backgrounds and a logo
7 graphics file will store any necessary logos. A menu display and cursor graphics file will store
8 menu display blocks and cursor highlight overlays as well as any other miscellaneous files
9 needed to build the menus. Using this method of storing menus, the menus can be changed by
10 reprogramming the graphics memory of the set top terminal 220 through instructions from either
11 the network controller 214 or operations center 202.

12 The microprocessor 602 performs the steps required to create a menu using stored
13 information. The microprocessor 602 fetches a background file, logo file, menu display and
14 cursor file in most instances. The microprocessor 602 fetches text from long-term, intermediate-
15 term, or short-term storage depending on where the text is stored. Using a video combiner (or
16 like device), the stored information is combined with video and the entire image is sent to the
17 television screen for display.

18 In the preferred embodiment, a graphics controller is used to assist the set top terminal
19 220 in generating menus. Menu generation by the set top terminal 220 begins with the building
20 of a major menu screen, which includes background graphics for that major menu. The
21 background graphics may include an upper sash across the top of the screen and a lower sash
22 across the bottom of the screen. The background graphics may be generated from the
23 background graphics file 800 in the memory files of the graphics memory (preferably EEPROM).
24 In addition, logo graphics may be generated. Such graphics typically include an icon window,
25 a cable company logo, a channel company logo, and two "go" buttons.

26 Preferably, the text for each major menu is generated separately by a text generator in the
27 set top terminal 220. Those portions of the text that generally remain the same for a period of
28 weeks or months may be stored in EEPROM or other local storage. Text which changes on a
29 regular basis, such as the movie titles (or other program selections), is transmitted to the set top

1 terminal 220 by either the operations center 202 or the network controller 214 of the cable
2 headend 208. In this manner, the cable headend 208 may change the program selections
3 available on any major menu 1020 by modifying the program control information signal sent by
4 the operations center 202 and transmitting any changes using the STTCIS.

5 Day, date and time information are added to each major menu. This information is sent
6 from the operations center 202, the cable headend 208 (signal processor 209 or network
7 controller 214), the uplink site, or generated by the set top terminal 220 internally.

8 The creation and display of program description submenus is performed by the set top
9 terminal 220 in a manner similar to that described above. Each submenu may be created in parts
10 and combined before being sent to the television screen. Preferably, background graphics and
11 upper and lower sashes are used. Likewise, a video window and half-strip window can be
12 generated from information in storage on the EEPROM.

13 In addition to graphics and text, some submenus include windows that show video. Such
14 video may be still or moving pictures. Still pictures may be stored in a compressed format (such
15 as JPEG) at the set top terminal 220. Video stills may be transmitted by the operations center
16 202 through the program control information signal from time to time.

17 Moving video picture is obtained directly from a current video feed as described above.
18 Depending on video window size, this may require manipulation of the video signal, including
19 scaling down the size of the video and redirecting the video to the portion of the menu screen
20 which is within the video window of the menu. Alternatively, the video may be obtained from
21 a split screen channel. Such a method involves the use of split screen video techniques to send
22 multiple video clips on a single channel at a given time. The set top terminal 220 would scale
23 the picture, if necessary, and redirect it to the correct position on the screen using known scaling
24 and positioning techniques. Additional circuitry may be required in the set top terminal 220 to
25 perform adequate scaling and repositioning.

26 To avoid the need for redirecting video into the portion of the screen which houses the
27 video window, masking and menu graphics may be used to cover the portions of the channel
28 video that are not needed. This masking technique allows the split screen video to remain in the
29 same portion of the screen that it is transmitted by the operations center 202. The masking is

1 then adjusted to cover the undesired portions of the screen. These masks are stored in the
2 background graphics file similarly to other background files for menus.

3 The split screen video technique may also be used for promoting television programming.
4 Since a great number of short video clips may be sent continuously, full or partial screen
5 promotionals (or informationals) may be provided to the subscriber. With this large quantity of
6 promotional video, the subscriber is given the opportunity to "graze" through new movie or
7 television programming selections. The subscriber simply grazes from promotional video to
8 promotional video until the desired television program is discovered.

9 10 C. Detailed Description of Advanced Set Top Terminal

11 1. Overview

12 The present invention involves a set top converter box or terminal 220 for a television
13 program delivery system 200. More specifically, an advanced set top converter box 220 acts as
14 a terminal in the viewer home. The set top terminal 220 is a key component of a digital cable
15 television delivery system 200. The set top terminal 220 is an upgradeable system that provides
16 for the decompression of digital program signals. The preferred set top terminal 220 provides
17 both a menu generation capability as well as a number of advanced features and functional
18 capabilities.

19 The set top terminal 220 of the present invention may be achieved through a set of
20 hardware upgrades to any of the following embodiments: (1) an existing set top converter 220
21 upgraded with a circuit card (which has a microprocessor electronically connected to the set top
22 converter 220), such as a Turbo card 700 or the like; (2) an industry standard decompression
23 converter 220 ungradable by either an upgrade module or a menu generation card; and (3) a set
24 top converter box 220 capable of both decompression and menu generation. The hardware
25 upgrades provide additional advanced features and functional capabilities to any of these
26 embodiments.

27 A number of advanced features and functional capabilities are supported by the preferred
28 set top terminal 220. This set top terminal 220 provides subscribers with a picture-on-picture
29 capability without requiring a special television to support the capability. The set top terminal

1 220 also supports a TV guide service, which provides subscribers with information on all
2 programming available at its particular subscriber location. The set top terminal 220 further
3 includes the capability of querying viewers to establish, among other things, favorite channel
4 lists, personal profile data and mood information. The set top terminal 220 allows the subscriber
5 to view promotional menus on future programming events.

6 The set top terminal 220 supports additional capabilities using its hardware upgrades that
7 allow subscribers to use other interactive services, for example, to engage in on-line question and
8 answer sessions, to order and confirm airline tickets, and to access a variety of other data
9 services. The set top terminal 220 makes use of a digital tuner as a hardware upgrade to provide
10 subscribers with a digital audio capability.

11 The preferred set top terminal 220 may be used to control video tape machines, thereby
12 simplifying the recording of programs. The set top terminal 220 can, in conjunction with the
13 program delivery system 200, easily support high definition television (HDTV). For subscribers
14 living in remote locations, the set top terminal 220 accommodates backyard satellite systems.
15 In addition to all the features that the set top terminal 220 supports with its current internal
16 programming and upgradeability, additional features may be added or existing features increased
17 through remote reprogramming of the set top terminal 220.

18
19 Table A shows several exemplary hardware configurations that may be used to achieve
20 the goals of the present invention. In particular, Table A shows four columns of set top converter
21 technology, which may be modified to produce the various set top capabilities shown in the three
22 rows of the table.

TABLE A

	Existing Analog Set Top Converter	Set Top Converter With Digital Decompression	Set Top Converter With Digital Decompression & Menu Generation Capabilities	Advanced Set Top Terminal
Decompression Capability	N/A	Built-In	Built-In	Built-In
Menu Generation Capability	Turbo Card	Upgrade Module or Menu Generation Card	Built-In	Built-In
Advanced Features	Level A-C Hardware Upgrades or Expansion Card	Level A-E Hardware Upgrades or Expansion Card	Level A-E Hardware Upgrades or Expansion Card	Built-In

The table shows the various inherent functional capabilities of each set top converter, and how each may be modified or upgraded, if necessary, to achieve the objectives of the present invention. From left to right, the columns of the table span the various alternatives for balancing those capabilities that may be built into set top converters or terminals, on the one hand, and those capabilities that can be provided through, for example, an upgrade module, expansion card or hardware upgrade of the present invention, on the other. This balance allows a designer or manufacturer of set top converters to choose between adding advanced functionality to an existing converter box or, instead, producing a converter with additional built-in features that increase cost and complexity of the converter or terminal.

The first column of Table A shows how an existing analog set top converter can be modified to provide menu generation capability through the use of the Turbo Card. In addition to the Turbo Card, such an existing analog set top converter may be further modified to provide any of the advanced features described below through the use of the Level A, Level B and Level C hardware upgrades or an expansion card. Such existing set top converter boxes are currently manufactured by Scientific Atlanta and General Instruments, among others. These converter boxes have been designed for use with analog waveforms and, as a result, digital decompression capabilities are not applicable.

1 The second column of Table A shows a set top converter with digital decompression
 2 capability. This converter is a simple decompression box which may eventually become the
 3 industry standard. The simple decompression boxes may be modified to provide the enhanced
 4 functionality of the present invention. For example, a simple decompression box may be
 5 modified to produce menu generation capability through the use of an upgrade module or menu
 6 generation card. In addition, other advanced features may be added to a simple decompression
 7 box through modifications that include any of the Level A through E hardware upgrades or an
 8 expansion card. Each of these modifications are described below.

9 The third column of Table A shows a set top converter that has built-in digital
 10 decompression and menu generation capabilities. Thus, in order to achieve the enhanced
 11 functionality of the present invention, other advanced features may be provided through hardware
 12 modification. Such modification may be accomplished through the use of any of the Level A
 13 through E hardware upgrades or the expansion card, as explained below.

14 The fourth column of Table A shows an advanced set top terminal having decompression,
 15 menu generation, and advanced functional capabilities. Each of these capabilities are built in to
 16 the terminal itself. In this way, achieving the enhanced performance of the set top terminal in
 17 accordance with the present invention would require no hardware modification.

18 In the preferred embodiment, the advanced set top terminal 220 of the present invention
 19 has the capability, among other things, of receiving tiered programming from the network
 20 controller. Tiered programming allows different users to view different video even though the
 21 subscribers are "tuned" to the same channel. For example, the network controller 214 may know
 22 the demographics of its subscribers through a database, by "learning" from prior subscriber
 23 choices, from an interactive selection, or from other means. Using the demographics
 24 information, the network controller 214 may target commercials to the correct audience by
 25 showing different commercials to subscribers with different demographics. Even though
 26 subscribers will believe they are "tuned" to one channel, each subscriber will be switched to a
 27 different channel for the tiered video. Alternatively, subscribers may be offered an option of
 28 several commercials from which to choose.

1 To accommodate foreign speaking subscribers, multiple audio channels for television
2 programming may be provided. In this way, the subscriber may be shown menus of programs
3 available in the subscriber's native language. The function of choosing the correct audio to
4 correspond to the selected language may be handled by either the set top terminal 220 or the
5 network controller 214 depending upon the configuration. Local programming in several
6 languages or additional audio channels for a foreign language translation of a popular television
7 program may be provided by the network controller 214. Using a picture-on-picture feature, sign
8 language may be similarly made available to certain set top terminals 220 for the deaf. Also, a
9 text overlay may easily be produced on the lower part of the screen for the deaf.

10 Typically, each video signal is received at the set top terminal 220 along with four audio
11 channels. Two of these audio channels will preferably be used for left and right stereo audio
12 reception of the video signal being displayed. The remaining two audio signals may be used for
13 alternative languages. For example, where a video signal is received by the set top terminal 220,
14 two of the audio channels will provide the stereo audio signals for that video in English, with the
15 other two audio channels providing mono audio signals in French and Spanish. In this way, each
16 video signal received at the set top terminal 220 can accommodate at least two foreign languages.
17 Where stereo audio channels are not desired, the audio channels in English can be set to a single
18 signal, providing mono audio reception, and increasing the multiple language audio channel
19 capability to three foreign languages.

20 In other embodiments, the network controller 214 can act as a central computer and
21 provide intra-set top terminal interactive games, inter-set top terminal interactive games,
22 computer bulletin board type services, message services (Electronic mail) etc. For example, a
23 subscriber may play war games with five (anonymous) fellow subscribers each in their own home
24 each operating a separate tank. The network controller 214 gathers the players via set top
25 terminal 220 communications and acts as the referee. A bulletin board or message system can
26 be set up to discuss a particular program such as "Twin Peaks Whodunit" for enthusiasts. These
27 interactive features are further described below with the interactive services level B menu and
28 the set top terminal hardware upgrade level B interactive unit.

1 In order to achieve the required throughput of video and audio information for the system,
2 digital compression techniques for video are employed. As a result, the set top terminal 220
3 typically must decompress any digitally compressed program signals that it receives. Methods
4 of decompression are a function of the compression technique used in the program delivery
5 system.

6 There are three basic digital compression techniques: within-frame (intraframe), frame-
7 to-frame (interframe), and within-carrier compression. Various compression methods may be
8 used with these techniques. Such methods of compression, which include vector quantization
9 and discrete cosine transform methodologies, are known to those skilled in the art.

10 Several standard digital formats representing both digitizing standards and compression
11 standards have also been developed. For example, JPEG (joint photographic experts group) is
12 a standard for single picture digitization. Motion picture digitization may be represented by
13 standards such as MPEG or MPEG 2 (motion picture engineering group specification). In
14 addition to these standards, other proprietary standards have been developed. Although MPEG
15 and MPEG 2 for motion pictures are preferred in the present invention, any reliable digital format
16 with compression may be used.

17 Various hybrids of the above compression techniques and methods have been developed
18 by several companies including AT&T, Compression Labs, Inc., General Instruments, Scientific-
19 Atlanta, Philips, and Zenith. Any of the compression techniques developed by these companies,
20 as well as other techniques known to those skilled in the art, may be used with the present
21 invention.

22 23 2. Advanced Set Top Terminal Major Components and Upgrades

24 a. Decompression Box with Upgrade Module

25 The preferred program delivery system uses digitally compressed signals and, as a result,
26 the preferred subscriber equipment configuration must be capable of decompressing and
27 processing such digitally compressed signals. Figure 9a diagrams the basic interplay between
28 an upgrade module 300 and a simple decompression box 302. The upgrade module 300 can be
29 connected to the decompression box 302 through a port similar to the upgrade port 662 described

1 above (Figure 5). The simple decompression box 302 shown is preferably a future industry
2 standard decompression box capable of communicating with an upgrade module 300 to enhance
3 functionality.

4 The upgrade module 300 provides menu generation capability to the simple
5 decompression box 302. The microprocessor of the simple decompression box 302
6 communicates with the microprocessor in the upgrade module 300 to provide the full
7 functionality of a set top terminal 220.

8 In the preferred embodiment, multipin connections may be used for a multiwire cable
9 connecting the simple decompression box 302 with the upgrade module 300. The multipin
10 connection may range from DB9 to DB25. A SCSI, or small computer systems interface, port
11 (not shown) may also be provided. Alternatively, four or more ports may be provided instead
12 of the single port depicted. If a port is not provided, the upgrade module may, alternatively, be
13 hard-wired to the simple decompression box 302.

14 As represented generally at 304, the digital data set of output wires of the simple
15 decompression box 302 will preferably output error corrected and decrypted data to the upgrade
16 module 300. The second set of wires, providing the interface connection, allows the
17 microprocessor in the upgrade module 300 to communicate with the microprocessor of the
18 simple decompression box 302. In this manner, the video circuitry of the upgrade module 300
19 and the simple decompression box 302 may maintain synchronization. The third set of wires,
20 providing the decompressed video output, provide the upgrade module 300 with a decompressed
21 video signal to manipulate. The fourth set of wires, comprising the video input set, allows the
22 simple decompression box 302 to accept a video signal that is a combined text, graphics, and
23 video signal.

24 Figure 9a further shows the CATV input 306, video input 308, and video and audio
25 outputs 310, 312, as part of the simple decompression box 302. This embodiment reduces the
26 component cost of upgrade module 300, and thus, is preferred. The upgrade module 300 may
27 simply be a cartridge (not shown) insertable into the simple decompression box 302.
28 Alternatively, as shown in commonly numbered Figure 9b, the CATV input 306, video input 308

1 and video and audio outputs 310, 312 may be included as part of the upgrade module 300. In this
2 embodiment, the simple decompression box 302 is primarily used for decompressing the video.

3 Referring to Figure 10, the upgrade module 300 preferably includes the following
4 circuitry: a video graphics and text demultiplexer 314; a text and graphics video plane combiner
5 316; a run length graphics decompressor 318; and, a run length compressed graphics memory 319
6 (nonvolatile RAM, ROM, EPROM, or EEPROM). By means of communications through the
7 multiwire connection between the upgrade module 300 and the simple decompression box 302,
8 compressed video and control signals may be demultiplexed by the demultiplexer 314 within the
9 upgrade module 300. The run length graphics decompressor 318, through communications with
10 the run length compressed graphics RAM 319, permits decompression of the input compressed
11 video signal. The text and graphics video plane combiner 316 allows demultiplexed and
12 decompressed signals to be output, through the simple decompression box 302, to a subscriber's
13 television 222 showing both video and overlay menus with text.

14 Figure 10 shows the elements of a simple decompression box 302 (numbered commonly
15 with the elements of the set top terminal 220 depicted in Figure 3) with the upgrade module 300
16 described above. Generated menus and video are combined in the combiner 316 and output to
17 an antitaping encoder 619. Any method of antitaping encoding known by those skilled in the art
18 may be used with the present invention.

19 Figure 10 also depicts an expansion card 320 and an expansion card interface 322 for
20 receiving the card 320. In addition, error correction circuitry 324 is shown receiving the
21 demodulated signal, prior to demultiplexing the signal.

22 The enhanced functionality of the upgrade module 300 may alternatively be included on
23 the expansion card 320. In this embodiment, the upgrade module 300 becomes an internal
24 component of the simple decompression box 302 and internally upgrades the box 302 to include
25 menu generation capability without using an external hardware upgrade module 300. Other
26 variations in the upgrade module 300 configuration are also possible.

1 b. Upstream Data Transmission

2 Figure 11 shows a preferred set top terminal 220 that includes a data receiver 332 and a
3 data transmitter 344. The data transmitter 344 provides upstream data communications capability
4 between the set top terminal 220 and the cable headend 208. Upstream data transmissions are
5 accomplished using the polling system described with reference to Figures 7a and 7b above, and,
6 in particular, using a data transmitter 344. Both receiver 332 and transmitter 344 may be built
7 into the set top terminal 220 itself or added through an upgrade module 300. Regardless of the
8 specific hardware configuration, the set top terminal's data transmission capabilities may be
9 accomplished using the hardware shown in Figure 11.

10 Figure 11 shows RF signals, depicted at 330, being received at by a data receiver 332 and
11 tuner 603 working in unison. Both of these devices are interfaced with the microprocessor 602,
12 which receives inputs, depicted at 338, from the subscriber, either through the set top terminal's
13 keypad 645 or remote control unit 900. All cable signals intended for reception on the
14 subscriber's TV are accessed by the tuner 603 and subsequently processed by the processing
15 circuitry 340. This processing circuitry 340 typically includes additional components for
16 descrambling, demodulation, volume control and remodulation on a Channel 3 or 4 TV carrier.

17 Data targeted to individual set top terminals 220 is received by the data receiver 332
18 according to each set top terminal's specific address or ID (e.g. set top ID 928, 928'). In this
19 way, each addressable set top terminal 220 only receives its own data. The data receiver 332 may
20 receive set top terminal specific data in the information field of the program control information
21 signal frame described with reference to Figure 7a or on a separate data carrier located at a
22 convenient frequency in the incoming spectrum.

23 Any received data includes information regarding channels and programs available for
24 selection. The subscriber may enter a series of commands using the keypad 645 or remote
25 control 900 in order to choose a channel or program. Upon receipt of such commands, the set
26 top terminal's microprocessor 602 instructs the tuner 603 to tune to the proper frequency of the
27 channel or program desired and subsequently instructs the processing circuitry 340 to begin
28 descrambling of this channel or program.

1 Upon selection of a channel or program, the microprocessor 602 stores any selection
 2 information in local memory for later data transmission back to the cable headend 208.
 3 Typically, the data transmitter 344 operates in the return frequency band between 5 and 30 MHZ.
 4 In an alternative embodiment, the frequency band of 10 to 15 MHZ may be used. Regardless,
 5 however, of the frequency band used, the data transmitter 344 sends information to the cable
 6 headend 208 or network controller 214 in the information field of the frame described with
 7 reference to Figure 7b. Those skilled in the art will recognize that a number of variations and
 8 combinations of the above-described set top terminal 220 hardware components may be used to
 9 accomplish upstream data transmissions.

11 c. Hardware Upgrades

12 In order to enhance a set top terminal's 220 functionality, the following hardware
 13 upgrades may be used: (1) a Level A interactive unit, (2) a Level B interactive unit, (3) a Level
 14 C interactive unit with compact disc capability, (4) a Level D digital radio tuner for separate
 15 room use, and (5) a Level E information download unit. Each of these upgrades is connected to
 16 the set top terminal 220 unit through the upgrade port 662 described earlier.

17 Level A, B and C hardware upgrades have similar hardware components. Figure 12a
 18 diagrams the basic components of the Level A, B and C hardware upgrades, indicated generally
 19 at 100. The figure diagrams the interaction between the hardware upgrades 100 and the set top
 20 terminal's 220 basic components. As seen in the figure, CATV input signals are received by the
 21 set top terminal 220 using a tuner 603 and various receiver components described above (but
 22 denoted generally at 601 in Figures 12a and 12b). The set top terminal's microprocessor
 23 coordinates all CATV signal reception and also interacts with various upstream data transmission
 24 components 604, which have been described above.

25 The Level A, B and C hardware upgrades 100 each include a microprocessor 104,
 26 interactive software 106, processing circuitry 108, bubble memory 112, and a long-term memory
 27 device 116. In addition to these basic components, the Level B hardware upgrade makes use of
 28 an additional telephone modem 120, while the Level C hardware upgrade makes use of an
 29 additional CD-ROM storage device 122.

1 Along with their basic components, the Level A, B and C hardware upgrades 100 each
2 use their own interactive software 106. This software may be used to provide the enhanced
3 functional capabilities described below. The Level A, B and C hardware upgrades also make use
4 of processing circuitry 108, which allows the set top terminal 220 to pass the subscriber's
5 interactive input to the Level A, B and C hardware upgrades 100 for interpretation. These
6 commands are passed through the interface linking the set top terminal's microprocessor with
7 the microprocessor of the Level A, B and C hardware upgrades 100. In this way, subscriber
8 inputs, entered through the set top terminal keypad or remote control, can be transferred to any
9 of the hardware upgrades for processing and responses generated therein can then be sent back
10 to the set top terminal 220 for display. In the preferred embodiment the IR commands are
11 transferred from set top terminal to hardware upgrade.

12 The Level A, B and C hardware upgrades 100 also include a long-term memory
13 component or device 116 that allows each hardware upgrade to internally store data used with
14 each interactive service. Such data may include, for example, customized menu templates used
15 by the individual interactive services. In addition, the Level A, B and C hardware upgrades
16 include a bubble memory 112 for the temporary storage of, for example, interactive questions and
17 responses used in each particular interactive service.

18 The Level A interactive unit allows the subscriber to access interactive services offering
19 additional information about programs such as quizzes, geographical facts, etc. This information
20 may be received by the set top terminal 220 in several data formats, including using the vertical
21 blanking interval (VBI) or the program control information signal. The Level A interactive unit
22 enables the subscriber to engage in textual interactivity with the current television program using
23 overlay menus. Some examples are quizzes, fast facts, more info, where in the world, products,
24 etc, all of which provide the subscriber with an interactive question and answer capability.
25 Although the Level A interactive capability can easily be built into the set top terminal 220, such
26 an embodiment increases the cost of the basic set top terminal 220.

27 The Level B interactive unit provides the user with access to online data base services for
28 applications such as home shopping, airline reservations, news, financial services, classified
29 advertising, home banking, and interactive teletext services. For example, with this upgrade, a

1 user will be able to reserve plane tickets or buy consumer electronics. The primary feature of this
 2 upgrade unit is that it allows actual transactions using two-way communications over modem
 3 with outside services. This added two-way communications capability may be with the cable
 4 headend 208 or, alternatively, over cellular networks, PCN or other communications media.

5 The Level C interactive unit employs a high volume local storage capacity, including
 6 compact disc or other random access digital data formats (e.g., CD-ROM 122). This unit allows
 7 use of interactive multi-media applications. Such applications include, for example, computer
 8 games, multi-media educational software, encyclopedias, other reference volumes (e.g.
 9 Shakespeare library), etc. In the preferred embodiment, many of these applications will interact
 10 with live programming providing additional information and interactivity to the basic program
 11 feed. For example, a viewer watching a show set in a foreign country may be able to retrieve
 12 additional information, maps, economic data, as well as other information about that country that
 13 are stored on the compact disc. In the Level C applications, the upgrade hardware may closely
 14 monitor the television broadcast through additional data channels (e.g., vertical blanking interval,
 15 or other digital data encoded within live video) providing context sensitive interactivity.

16 Figure 12b diagrams the interaction between the set top terminal 220 and the Level D
 17 hardware upgrade, indicated generally at 130. As shown in the figure, the CATV signals are
 18 input to the set top terminal 220 through its tuner 603 and receiver components 601. As
 19 described above, the microprocessor 602 coordinates all cable television signal reception by the
 20 set top terminal 220. The Level D hardware upgrade 130 makes use of a microprocessor 132,
 21 a tuner 134, a demodulator 136, a demultiplexer 138, a decryptor 140 and an audio decompressor
 22 142.

23 As shown in the figure, the set top terminal 220 and the Level D hardware upgrade 130
 24 interact through the interface linking the respective devices. The set top terminal's
 25 microprocessor 602 instructs received signals to be transferred to the Level D hardware upgrade
 26 130 for further processing. These received signals are input to the Level D hardware upgrade,
 27 passed through the signal path comprising the tuner 134 and other digital audio reception
 28 components (i.e., demodulator 136, demultiplexer 138, decryptor 140 and audio decompressor
 29 142). Through the use of the hardware as configured in Figure 12b, the subscriber can select a

1 digital audio program for listening. The subscriber can accomplish such selection through a
2 subscriber interface (not shown), which may exist at the set top terminal 220 or, alternatively, at
3 the Level D hardware upgrade.

4 The Level D hardware upgrade allows the subscriber separate access to the digital radio
5 channels while other programming (not necessarily radio) is being viewed on the television.
6 Typically, this upgrade would be used for digital radio usage in a separate room from that of the
7 television. The upgrade has a separate tuner, decompressor, and visual display. In the preferred
8 embodiment a second remote control (which is preferably a scaled-down version of the set top
9 terminal remote control, described below) is provided to access the digital audio system. This
10 remote is equipped with a display.

11 The Level E hardware upgrade allows the subscriber to download large volumes of
12 information from the operations center 202 or cable headend 208. The Level E hardware upgrade
13 will enable subscribers to download data, such as books and magazines, to local storage.
14 Primarily, the Level E hardware upgrade is an additional local storage unit (e.g., hard disk,
15 floppy, optical disk or magnetic cartridge). Preferably, a small portable reader, called
16 "EveryBook™", is also provided with the upgrade to enable downloaded text to be read without
17 the use of a TV. The portable reader is equipped with a screen.

18 The downloadable information may be text or video supplied by the operations center 202
19 or cable headend 208. With this upgrade, books may be downloaded and read anywhere with the
20 portable reader. Using this upgrade, video may be downloaded and stored in compressed form
21 for later decompression. The video would be decompressed only at the time of viewing.
22 Important text that the public desires immediate access may made available through this system.
23 Text such as the President's speech, a new law, or a recent abortion decision rendered by the
24 Supreme Court may be made immediately available.

25 Using a more sophisticated port, such as the SCSI port, multiple hardware upgrade units
26 may be connected, or "daisy-chained" together, to operate simultaneously. Although these
27 upgrade units are described separately, the units may be combined or built into the set top
28 terminal 220. Those skilled in the art will recognize variations on such combinations of and
29 additions to the set top terminal hardware.

1 d. Expansion Card Slot

2 In order to provide the greatest flexibility possible and prevent a set top terminal 220 from
3 becoming outdated during the terminal's useful life, additional electronic expansion card slots
4 have been built into the preferred embodiment. The expansion slots 665 (depicted in phantom
5 in Figure 5) are covered by the metal plate cover 664 as shown in Figure 5. It is anticipated that
6 additional memory or capabilities may be needed for certain customer features and also to update
7 the system as the cable delivery system's capabilities increase.

8 In addition to providing an additional memory capability, the expansion card slot provides
9 an easy method to upgrade the set top terminal hardware. In particular, expansion cards can be
10 used to internally provide any of the Level A through E hardware upgrade features described
11 above. Such embodiments, however, use the upstream data transmission hardware, also
12 described above (or built-in modem).

13 Functionally, the expansion card (not shown) may be inserted into an expansion card slot
14 665, causing the connector on the expansion card to electrically link with a card connector on the
15 set top terminal 220. Preferably, the frame of the set top terminal has a shelf or rack position to
16 hold the expansion card. The card connector on the set top terminal 220 may simply be an
17 electrical connection to the set top terminal's microprocessor and/or memory device or devices.
18 Alternatively, the interface between the expansion card and the set top terminal 220 may be an
19 electrical bus that allows the memory resources of the set top terminal 220 to be directly
20 expanded. In this case, the expansion card itself contains a memory device or devices that
21 expand the amount of program information or data that the set top terminal 220 may access.
22 Such memory devices include RAM, ROM, EPROM or EEPROM. In addition, the interface
23 may be a "mailbox," which resides in the set top terminal 220 as a single memory location. This
24 embodiment facilitates the transfer of data between the set top terminal 220 and the expansion
25 card in either serial or parallel format. Such transfers are coordinated and controlled by the set
26 top terminal's microprocessor 602.

27 The use of expansion cards lowers the cost of the set top terminal 220 itself, while also
28 increasing its potential functionality. Thus, an expansion card may include enhanced functional

capabilities described as part of the upgrade module discussion above and be designed to accommodate any hardware upgrade compatible with the set top terminal 220.

3. Advanced Features and Functional Capabilities

a. Overview

In the preferred embodiment, the set top terminal 220 will include features that are now being adopted in the industry, including parental controls and locks, electronic diagnostics and error detection, muting, on-screen volume control, sleep timer, recall of last selection, etc. Each of these features has a corresponding menu (or overlay menu) that allows on-screen customizing and activation of the feature.

The preferred set top terminal 220 also supports a number of advanced features and functional capabilities. This set top terminal 220 provides subscribers with a picture-on-picture capability without requiring a special television to support the capability. The set top terminal 220 also supports a program catalogue Service, which provides subscribers with information on all programming available at its particular subscriber location. The set top terminal 220 further includes the capability of querying viewers to establish, among other things, favorite channel lists, personal profile data and mood information. The set top terminal 220 allows the subscriber to view promotional menus on future programming events.

The set top terminal 220 supports additional capabilities using its hardware upgrades that allow subscribers to use other interactive services, for example, to engage in on-line question and answer sessions, to order and confirm airline tickets, and to access a variety of other data services. The set top terminal 220 makes use of a digital tuner as a hardware upgrade to provide subscribers with a digital audio capability.

The preferred set top terminal 220 may be used to control video tape machines, thereby simplifying the recording of programs. The set top terminal 220 can, in conjunction with the program delivery system, easily support high definition television (HDTV). For subscribers living in remote locations, the set top terminal 220 accommodates backyard satellite systems.

In addition to all the features that the set top terminal 220 supports with its current internal programming and upgradeability, additional features may be added or existing features

1 increased through remote reprogramming of the set top terminal 220. Utilizing the resident
2 operating system on the read only memory (ROM), the cable headend 208 is able to reprogram
3 the random access memory (RAM) of the set top terminal 220. With this capability, the cable
4 headend 208 can remotely upgrade software on the set top terminals 220.

5 Reprogramming will occur by using the program control information signal, with the
6 appropriate signals sent over this signal. In an alternative embodiment, one channel is dedicated
7 for the special programming needs. When reprogramming is to occur, the cable head end will
8 send an interruption sequence on the program control information channel that informs the set
9 top terminal 220 that reprogramming information is to follow.

11 b. Promotional Menus

12 Figure 13 depicts the use of a promotional menu 1120 used to sell subscriptions to
13 services in the system 200. This promotional menu is tailored to Level B interactive services
14 which include a variety of on-line type services such as Prodigy, Yellow Pages, Airline
15 Reservations, etc. A similar menu is used for Level A interactive services that offers subscribers
16 additional information about programs such as quizzes, geographical facts, etc. Such information
17 may be received by the set top terminal 220 in several data formats, including in the vertical
18 blanking interval (VBI) and in the program control information signal.

19 Other promotion menus similar to menu 1120 may be used for the Level C interactive
20 services. The Level C interactive services utilize local storage such as CD technology (e.g., 122)
21 to offer an enormous range of multi-media experiences. The Level C interactive services require
22 a hardware upgrade as described earlier. Specially adopted CD-I and CD-ROM 122 units are
23 used for this service.

24 Typically, promotional menus may be generated when a subscriber selects a nonexistent
25 channel, creating a virtual channel. Such virtual channels do not require any additional
26 bandwidth since these channels do not carry any of the data required to create a promotional
27 menu. Instead, when the subscriber selects a channel that does not exist (e.g., Channel 166), a
28 virtual channel is created using data sent to the set top terminal in a number of ways. For
29 example, the data may be sent in the vertical blanking interval (VBI) of another channel, out-of-

1 band, or with the menu information sent from the headend 208 in the set top terminal control
2 information stream (STTCIS). The data will be used to create graphics stored locally at the set
3 top terminal 220 as an NTSC video signal which may be displayed on the subscriber's television.
4 In this way, a promotional menu may be drawn and a virtual channel is created. This capability
5 simply provides the set top terminal 220 with the ability to display a promotional menu or
6 graphics display whenever a nonexistent channel is selected by the subscriber.

7
8 c. Other Interactive Services

9 Figures 14a and 14b show menus (1130 and 1132, respectively) that are available using
10 the interactive Level A services. Referring to Figure 14a, when interactive Levels A services are
11 available for a television program, the system will display an interactive logo 1134 consisting of
12 the letter "I" and two arrows with semicircular tails. In the preferred embodiment, the set top
13 terminal 220 will place the interactive logo on the television screen as an overlay menu. In the
14 preferred embodiment, the set top terminal 220 will detect that there is data or information
15 available about a television program which can be displayed to a subscriber using the interactive
16 service. When the set top terminal 220 senses that there is interactive information available, it
17 will generate the interactive logo overlay menu 1134 and place it on the television screen. For
18 example, the set top terminal 220 will detect that information on a television program is being
19 sent in the vertical blanking interval (VBI) and generate an interactive logo overlay menu 1134
20 which will appear on the subscriber's television screen for approximately fifteen seconds during
21 each ten minute interval of programming. Similarly, the set top terminal 220 can sense that the
22 programming has closed caption information available and place a closed caption logo on the
23 screen.

24 Referring to Figure 14b, when the subscriber sees the interactive logo 1134 on the
25 television screen, the subscriber is made aware of the fact that interactive services are available
26 in conjunction with his television program. If the subscriber presses the interactive remote
27 control button, another overlay menu 1133 will be generated by the set top terminal 220 and
28 placed on the screen. This overlay menu 1133 is shown in Figure 14b being overlayed on an
29 interactive television program. From this menu 1133, the subscriber may select a variety of

1 different types of textual interactivity with the current television program, as at 1134, including
2 quizzes, fast facts, more info, where in the world, products, etc. At any time during the
3 interactive submenus, the user may return to the television program without interactive features.

4 Another submenu 1136 gives additional information related to the television program to
5 the viewer in textual form in the lower half of the screen. In Figure 14b, the submenu 1136
6 shows the available interactive options for the subcategory "quiz." In this interactive
7 subcategory, the user is presented with questions and a series of possible answers. If the
8 subscriber desires, the subscriber selects one of the answers to the quiz question. After the
9 selection, the set top terminal 220 sequences to another menu. The set top terminal 220
10 sequences to the interactive quiz answers submenu which informs the subscriber whether the
11 correct answer was or was not chosen. Subsequently, another submenu would show correctly
12 or incorrectly answered quiz question.

13 Figure 15a is an example of a submenu for Level B interactive services. From this menu
14 screen 1141, any of a number of on-line data services could be accessed. One service, the airline
15 reservations selection 1142, has been chosen by the subscriber on this menu.

16 In selecting airline reservations, the subscriber encounters a sequence of menus as for any
17 on-line data service. Referring to Figure 15b, the subscriber is typically shown a submenu, such
18 as submenu 1144, for the data service offering various options. In each of these submenus
19 related to a data service, the subscriber is able to exit, returning to the home menu 1010 or regular
20 cable TV.

21 Figure 15b, the airline information and reservation submenu 1144, allows a subscriber
22 to view six available flights. A subscriber may select one of the flights to check on its
23 availability. Another similar submenu allows a subscriber to enter the month, day and year for
24 the availability date desired. In this submenu, the subscriber is offered the option of correcting
25 any errors in the entered information.

26 Figure 15c is another airline submenu 1150 that allows a subscriber to view remaining
27 seats available on a flight, enabling the selection of a seat assignment. This interactive submenu
28 1150 is an example of how information may be graphically shown to a subscriber using a portion
29 of the menu and different coloring schemes. In this interactive menu, the lower half of the screen

1 1152 shows the passenger compartment of an airplane with all the seat locations graphically
 2 represented by square blocks. By coloring the available seat locations in blue and the unavailable
 3 seat locations in a different color, the menu can present a great deal of information in a limited
 4 amount of space. This graphic presentation of information for the interactive on-line data
 5 services is an important method of visually displaying large amounts of information to the
 6 subscriber.

7 Referring to Figure 15d, another submenu 1156 allows the subscriber to choose a one-
 8 way or round-trip ticket, to confirm reservations and to charge an airline ticket by credit card,
 9 choosing the appropriate strip menu on the lower part of the screen. In this particular menu 1156,
 10 the subscriber is charging a round-trip plane ticket on a credit card. The subscriber simply needs
 11 to enter the credit card number, expiration date, and credit card type to charge an airline ticket.
 12 Other submenus may process the subscriber's credit card charge for the airline ticket, confirm
 13 the subscriber's airline ticket purchase, and pass this information to the location where the ticket
 14 is printed.

15 Using the methods and hardware described, a variety of interactive services are possible.
 16 Those skilled in the art will recognize that such interactive services may be accommodated by
 17 the preferred set top terminal 220.

18
 19 The terms and descriptions used herein are set forth by way of illustration only and are
 20 not meant as limitations. Those skilled in the art will recognize that numerous variations are
 21 possible within the spirit and scope of the invention as defined in the following claims and their
 22 equivalents.

23
 24 What we claim is: